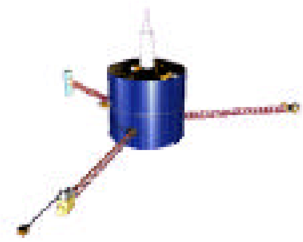


# Space Day: Prospecting for Knowledge

## 11- Magnetism -Teacher’s Page

How A Compass Works.

-Pick up a compass and hold it in your hand.
-Turn the compass holder around so that the N, for North, is under the pointed end of the arrow.
-Now turn your body completely around in a circle while you are watching the Arrow.

What happened? The arrow is a tiny magnet and always pointed in the same direction towards the North Pole of the Earth no matter which way you were facing. This shows that the earth is also a giant magnet and the arrow of the compass will always point to what people call the North Pole of the earth. (Continue with Experiment 2)

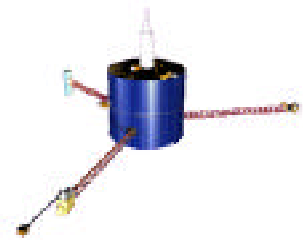
How Magnets Affect Each Other.
- Put the compass back on the table.
- Now slide the end of the bar magnet with the "S" for South so that it is against the side of the compass. Notice that the arrow swings around till it is pointing to the South Pole of the magnet.
- Then turn the bar magnet around until the side of the South Pole is against the compass. Then slide the compass along the side of the bar magnet till it gets to the other end of the magnet. Note that the arrow will gradually swing around and point in the opposite direction.

What happened? When you brought the bar magnet near the compass, the arrow turned and pointed to the S because the magnetic field of the bar magnet is stronger than the earth's magnetic field at that point. As you move the compass along the side of the bar magnet, the other end of the needle will start moving closer to the bar and towards the opposite pole as its magnetic field becomes stronger. When you get to the other end, the tail of the compass will now be pointing directly to the opposite pole of the magnet. What have we shown? There are always two poles to a magnet and that opposite poles attract each other and like poles will repel each
other.

What Kinds Of Materials Are Magnetic And Can Be Picked Up By A Magnet?
- Pick up the magnet and see which of the materials on the table can be attracted to the magnet.
Magnet materials are: paper clips, nails, staples, and tin can lids.
Non-magnetic materials are: paper, wood, soda straws, copper pennies, and corks.

Seeing What The Magnetic Field of a Bar Magnet Looks Like

A short bar magnet has been taped to the bottom of the piece of plastic which is supported on cans.
- Place the sheet of paper on the plastic with the circle over the area where the magnet is located.



# Space Day: Prospecting for Knowledge

- Carefully sprinkle a small amount of the iron filings over the circled area which is somewhat longer and wider than the magnet. Notice the pattern.
- Move the paper around in circles over the magnet and notice whathappens.
- Carefully pick up the paper and pour the iron filings back into the can.

What happened? The iron filings formed a pile or clump over the north and south poles where the magnet fields are strongest and also along the magnetic lines of force that extend slightly away from one pole and then in an arc back to the other pole. When you moved the paper with the iron filings around under the magnet, the filings piled up over the poles because of the stronger magnetic field.

What Is Electro-Magnetism?

What you see in front of you is a coil of yellow wire that is wrappe around a large nail. The wire starts from one terminal of a battery, goes around and around the Nail, then to a push button switch, and finally back to the battery. The lid from a tin can is hanging near one end of the nail that is in the coil of wire.

- Push the button. PLEASE DO NOT HOLD THE BUTTON DOWN FOR ANY LENGTH OF TIME AS IT WILL RUIN THE BATTERY.

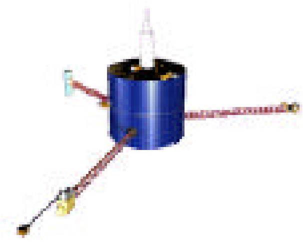
What happens? electricity flows from the battery through the coil of wire producing a magnetic field in the coil. The magnetic field in the coil is strong enough to temporarily make the nail act like a magnet while the current is flowing. The magnetic field from the nail then attracts the lid from the tin can.

- Release the button, the electricity stops, the magnetic field collapses and the lid from the tin can returns to its original position.

How did this happen? You saw that when iron filings were sprinkled over a magnet, the filings lined themselves up to show us the lines of force or the magnetic field around the bar. To do this, one end of each tiny filing becomes a North end and the other becomes a South end. Each North Pole of an iron filing faces the South Pole of the particle next to it. When current from this battery passes through the coil of wire, the current is creating a magnet field in the coil with one end North and one end South. With the nail in the coil, the magnetic field created by the coil lines up all the very tiny molecules of metal in the nail in one direction, just like those iron filings over a bar magnet, with all the tiny North Poles pointing in one direction and all the tiny South Poles pointing in the other direction, and it becomes a temporary bar magnet. When the button is released, the molecules of iron under stress relax and return to their normal position and the nail is no longer magnetic.

Seeing The Earth's Magnetic Field.

Activities courtesy of University of Hawaii Institute of Geophysics and Planetology, Astronomical Society of the Pacific and NASA.



# Space Day:
# Prospecting for Knowledge

The globe in front of you is like the earth and it has a strong magnet installed inside it to simulate the earth's magnetic field.
- Using a compass, locate the North and South Poles.
- Gently sprinkle some staples over the globe.

What happened? The staples will bunch up at the North and South poles and, if you distribute them carefully, they will form lines running from one Pole to the other.

HOW DID THE EARTH BECOME A MAGNET? The earth is spinning around while it is orbiting the sun. Every day the sun is radiating visible light at all times that the sun can be seen. What you do not see is that the sun is also sending off invisible electrical waves at all times that create an electric field through the earth. That electric field is like the electrical field that is created by the electric current flowing from the battery through the coil of wire. You may know that the center of the earth is full of molten metal and other material, much of which is iron, just like the nail in the electro-magnet or the bar magnet. As the earth orbits through the electric field of the sun, it causes each drop of iron to line up, like tiny magnets, with one end facing in the direction we commonly call North and the other end in the direction we call South. The magnetic field is powerful enough that we can use it to determine directions on earth witha compass.

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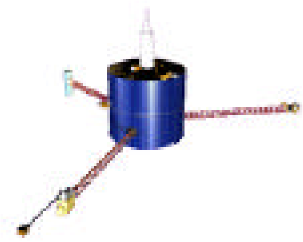

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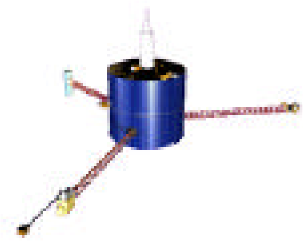

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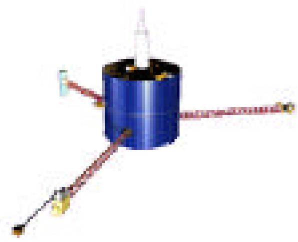

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